The Northwestern MILLER

MILLING PRODUCTION SECTION

European Mills and Milling as Seen by an American Miller

By Kenneth L. Nordstrom

General Mills, Inc.

Because of the great many things which have already been said about European milling, I should like to confine this talk merely to a brief summary of my impressions obtained during a trip in which Eugene Woolley and I visited mills in Sweden, England, Belgium, Holland, Germany, Italy, Switzerland and France. As a matter of fact, when I was asked to discuss European milling, I hesitated for quite some time before accepting. A single trip to Europe does not make one an authority on the subject. Furthermore, I certainly have no intention of placing myself in the so-called "middle" by attempting to analyze the merits of different milling equipment.

First of all, I would like to mention the outstanding cooperation we received from everyone, and especially the personnel in the various mills visited. They were very willing to show us their entire mill and certainly went out of their way to make us feel that we were welcome to their country. I only hope that some of these gentlemen have the occasion to visit America so that we can return their courtesies.

It was a pleasure to find so many highly-trained technical millers associated with most of the various mills visited, and also with the manufacturers of mill machinery. These men were devoting their efforts and studies to improving the fundamentals of flour milling, such as methods of tempering, proper grinding on breaks and reduction rolls, proper classification of stocks throughout the mill, etc. In addition, most of the operative millers were very proud of their stock classifications, and it was apparent that they put forth a great deal of effort toward maintaining these classifications on a uniform 24-hour basis.

I particularly want to mention this point because at times we all fall into the bad habit of taking our mill for granted and not giving it the proper attention needed for top performance. It takes more than new machinery or even a new mill to accomplish a successful milling job. It still takes someone who knows how to run that mill.

The milling industry in Europe certainly deserves a lot of credit for the fine job accomplished in rebuilding its mills which were destroyed during the war. As a matter of fact, the excess capacity which apparently exists in most countries would indicate that too good a job has been done. Nevertheless, the new mills we saw were beautifully constructed and certainly can be considered show places. It was amazing to see how liberal they had been in providing ample floor space for their rated capacity. It was interesting to note that a lot of pride was taken in the appearance of the mill, but still not too much concern was expressed over sanitary conditions on the inside of equipment. All new mills were equipped with pneumatic handling which certainly improves sanitation in the mill. But it was not uncommon to see the installation of many old-style wooden conveyors. In some cases the installation of such conveyors actually nullified the sanitary advantages gained by the use of pneumatic.

Show Places

Another interesting point, we were told, is that some companies spend a considerable amount of extra money in making their mill a show place because of the large number of visitors they have each year. They consider this one form of advertisement.

Kenneth L. Nordstrom

Some of the mill manufacturers are in the process of redesigning their equipment and making it completely housed in. They have several reasons for this approach: First, to comply with strict regulations of different countries for guarding moving equipment; second, to improve the cleanliness of the mill; and third, to improve the looks of the mill. Milling equipment that is completely housed in, so that no moving parts can be seen, accomplishes the objective of making a nicer looking mill. However, I do not see how this feature necessarily helps the cleanliness of a mill, particularly from within the equipment.

The basic equipment used in Europe for the removal of foreign material from the dirty wheat is essentially the same as that used in this country, except for the pneumatic aspirator. Almost all mills visited did, however, have a very elaborate setup for tempering or, as they call it, conditioning the wheat for milling. In all cases conditioning consisted of wheat washing followed by driers. In some cases the use of live steam was also incorporated into their tempering system. In addition, each type of wheat used for a mill mix was cleaned, washed and conditioned separately prior to blending. This type of operation is necessary for them due to the very wide differences in types of wheat that they have to use in making up their mill mixes. For example, the hard wheats used in a mix would be tempered up to as high as 18%, whereas the soft wheats used in this same mix would probably have to be dried down from a high moisture level to possibly 15 or 16%.

As a result of this kind of tempering and taking into consideration the mixture of wheat comprising the mix, we found the wheat to the first break roll in most cases was in very good condition for proper milling. Even though the total wheat mix would be considered high in moisture in comparison with American milling, it did not appear so on the mill. In view of the fact that at times up to 60% of hard wheat would be used in a mill mix, the middlings were very mellow and reminded me a lot of our regular soft wheat mills in this country. Due to this condition, plus light roll loadings, it was not uncommon to see the production of flakes on their middling reduction rolls. It is, therefore, understandable that they make extended use of flake busters as a part of their milling system.

I had always heard and read a lot about European milling with their long flows and open grinding on the breaks. Therefore, I was quite surprised to find that most of the bread wheat mills were using the conventional five breaks with releases very comparable to those in this country. It was not uncommon to find first breaks set as high as 35% through an 18 or 20 wire, and second breaks above 50%. However, the type of grinding accomplished by their break rolls was considerably different. Slow roll speeds, along with light loads, accompanied by the extended use of sharp corrugations, resulted in the production of many chunks but very little break flour. This type of break grinding was then followed by a much more elaborate purification system than is normally used in this country.

Considering the soft, mellowing conditioning of their wheat, I can see where this type of break grinding is desirable for a minimum production of break flour. However, in accomplishing this, the larger volume of good-sized middlings and chunks is perhaps a little dirtier than we would normally expect. This leads to the necessity for a good purification system. The fact that the middlings entering the head end of the reduction system were in most cases exceptionally clean, spoke well for the purifiers being used. In my opinion, this is where the European flow becomes considerably longer than the flows I am familiar with in America.

It was not uncommon to see a bread wheat mill with four complete and separate sizings systems, each with their own purification. In addition, stocks from both fourth and fifth breaks were being sent to separate purifiers. It was interesting to note that these stocks were of such a nature that I doubt if millers in this country would consider them a proper purifier stock. It is easily understandable how mills like these can reach out and produce a very acceptable long extraction flour.

The majority of mills visited were equipped with pneumatic handling in the mill proper. From the standpoint of mechanical operation, it

(Continued on page 13a)

EDITOR'S NOTE: In the accompanying article, Kenneth L. Nordstrom summarizes his impressions of European milling. His remarks are based on a trip to Europe in which he visited flour mills in several countries. Mr. Nordstrom is general milling superintendent for General Mills, Inc., Minneapolis. The article is from the Bulletin of the Association of Operative Millers and a talk by Mr. Nordstrom at the AOM technical conference.

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WHEAT PRODUCTS FOR INDUSTRIAL USES

By F. E. Horan

Wheat is big business, and is essential to the economy of the U.S. When one considers the some 70 million acres of wheat harvested annually, yielding 1.0 to 1.3 billion bushels valued to the farmer at about $2,000,000,000, it is easy to understand the importance of this crop. In order to comprehend the relationship between the amount of wheat grown and the amount consumed in the U.S., it is instructive to examine the statistics for a typical recent year, say 1950 (28). In that year, of 1 billion bushels produced, 354 million were exported, leaving 646 million bushels for home consumption; however, the number of bushels so used was only 481 million, leaving a surplus of 165 million. This surplus has been building up for several years, and it is estimated that there are approximately 800 million bushels now bulging our nation's warehouses (11).

The surplus can be accounted for in part by the fact that our farmers are now growing more wheat and that we as a nation are eating less bread, i.e., wheat flour. By way of example, in 1939 the U.S. wheat production was 709 million bushels as compared to 1.3 billion bushels in 1952; the per capita consumption of wheat flour was 156 lb. in 1939 and 130 lb. in 1952 (28). This is an 83% increase in production and a 16% decrease in per capita consumption of wheat flour. Of course, it is realized that the population has increased during this 14-year span, but in spite of this, surpluses remain.

As was pointed out in the Conference on Wheat Research (30) held at the Northern Regional Research Laboratory in September, 1953, the most promising outlet for increased use of wheat is human food, and this could probably best be brought about by advertising and consumer education and by modifying the type of bread loaf sold to the public. It was also stated at this conference that since wheat, at present prices, is not competitive with other grains, the nonfood uses of wheat are not likely to bring increased sales in the near future. However, in the following discussion an attempt is made to illustrate how at least one industrial concern is utilizing wheat in a manner quite removed from the milling and baking industries.

Processing Wheat for Industry

Contemplating the use of starch in industry prompts one to compare the proximate chemical analysis of wheat (29) with that of corn (16). The data in Table 1 show that wheat, as is the case with all cereal grains, consists primarily of starch, with protein the other principal component. Even though the percentage of starch in corn is higher than in wheat, the calculated yield per bushel is about the same (37-38 lb.) because corn grain is measured 56 lb. per bushel and wheat 60 lb. (19).

The utilization of wheat industrially, then, necessitates an efficient separation of the starch from the protein (gluten) and the other minor components in the wheat kernel. Several methods are available and are reviewed very briefly at this time. Merely soaking the wheat kernels in water and then crushing the softened grains in a bag and washing with water permits the separation of some of the wheat starch in the form of a slurry. This is, in essence, the Alsatian method in which the grains are soaked in warm water for one or two days. The grain is then crushed lightly and the mash is washed with water to

EDITOR'S NOTE: As pointed out in the accompanying article, the most promising possibility for increased wheat use continues to be food. However, as explained here, wheat also has possible industrial uses. And many millers may be interested in information on the processing of wheat for industrial uses. The author, F. E. Horan, is with the Huron Milling Co., Harbor Beach, Mich. This article is adapted from a paper in the AACC Transactions, published by the American Association of Cereal Chemists.

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remove starch from the doughy mass. The starch slurry is then sieved and settled out on starch tables or in centrifugals. Yields of about 45% starch may be obtained by this method.

Langford and Slotter have modified the Alsatian process by adding sulfurous acid in the liquors used in steeping wheat grain. The sulfurous acid reduces the cohesiveness of the gluten sufficiently so that the conventional wet milling techniques of the corn starch industry may be employed. A 55 to 60% yield of starch with a low protein content (0.2%) can be obtained. The native gluten is devitalized in this treatment. In the Halle process, a fermentation step is employed after the grains have been soaked. This fermentation requires about one week at 25° C. and changes the gluten so that the starch can be washed out easily. Yields of 60% starch low in protein can be obtained by this process, but objectionable odors, long period of fermentation, and destruction of the gluten are undesirable features.

An alternative general method of isolating wheat starch consists of using wheat flour instead of the whole grain. The "batter" process uses a wheat flour made into a slurry with about four parts of water at 40° C. This slurry is disintegrated by a propellor stirrer operating at high speed, forming curds of gluten which are removed by screening. The starch is recovered by centrifuging. Yields as high as 90% of the available starch have been reported.

An alkali process has been developed by Dimler wherein wheat flour is mixed with six parts of a 0.03 N solution of sodium hydroxide to disperse the gluten. The starch is separated by centrifuging and yields of 70-80% available starch can be obtained.

The Martin process is probably the most important industrial method at this time, being used both in the U.S. and Europe. Wheat flour is worked into dough with about 40% of its weight of water. After the gluten has hydrated, the dough is cut into large lumps which are kneaded and washed with water to remove the starch. About 45-55% of good starch on the weight of the wheat flour, 10-20% of inferior starch (known as "tailings" in industry—when settling tables are used, the prime starch remains on the table and the inferior starch "tails over"), and 10-15% of good-grade gluten free from husks can be obtained (6, 16, 25). An illustration of the Martin process in actual industrial practice is given in Fig. 1.

Table 1—Composition of Wheat* and Corn (Moisture-Free Basis)

Product—	Protein	Fat	Ash	Starch	Pentosans	Sugar	Undetermined
Wheat:							
Whole grain	17.63	2.16	2.14	61.2	5.98	3.02	7.80
Patent flour	16.48	1.05	0.49	77.1	1.83	1.44	1.61
First clear flour	17.52	1.65	0.75	72.9	2.32	1.58	3.25
Second clear flour	20.90	2.69	1.63	65.0	2.96	2.41	4.22
Corn—Whole grain	10.04	3.68	1.84	68.0	6.36	...	9.94

*Hard red spring.

In order to use wheat starch successfully in industry it is necessary to know its properties. Perhaps the best yardstick for an evaluation of wheat starch is a comparison with corn starch, which is the most important commercial starch in the U.S. today and which likewise is a typical cereal starch. Similarities and also differences should show the way to greater applications for wheat starch in industry.

Composition of starches. Typical proximate analyses of prime wheat starch, wheat starch tailings, and pearl corn starch, given in Table 2 below show little difference between

Table 2—Chemical Analyses of Starches

	Wheat starch— Prime %	Wheat starch— Tailings %	Corn starch %
Moisture	11.5	10.0	9.9
Protein	0.20	2.5	0.36
Ash	0.12	0.5	0.08
Ether extract	0.04	0.38	0.10
Solubles	0.20	4.8	0.10

prime wheat starch and pearl corn starch. The wheat starch tailings, however, contain relatively high percentages of protein, ash, fat, and solubles. These analyses do not show the possible importance of pentosans in wheat flour. Baker, Parker and Mize (2) have shown that there is 33 times as much water-insoluble pentosan material in the small starch (3.9μ) as in the large starch granules (21.4μ). The small starch granules had 30.4 times as much surface and 33 times as much pentosan as did the large starch. The suggestion has been made that all wheat starch granules have a pentosan content proportional to their surfaces and that the pentosans are deposited upon the surface of the starch granules. Clendenning and Wright (9) maintain that there is no evidence of pentosan films on individual granules of prime wheat starch. However, they have shown that the quality of crude starch can be improved, i.e., the protein and pentosan contents lowered, by first digesting the starch suspensions in acid solutions. There seems to be little doubt that the pentosans, along with proteins, influence the properties of wheat starch considerably.

Granules. Wheat starch is composed of granules ranging in diameter from 2 to 35 μ. The larger granules are thin and lenticular in form, the smaller ones spherical. An analysis (1) has shown that about 19% of the granules have diameters greater than 7.5μ (81% are smaller). The granule sizes for corn starch range between 10 and 25 μ (25).

Gelatinization temperature and viscosities. Caesar and Moore (7) have demonstrated in their work with 20% starch pastes that although the wheat starch granules begin to swell at a lower temperature (142° F.) than corn (150° F.), the temperature range from the time of beginning swelling to that of maximum viscosity is considerably larger for wheat (42° F.) than for corn (11° F.). This difference is attributed to the granule size distribution. Corn starch gives a viscosity higher than that of ordinary wheat starch, and more stable with time of cooking. However, by means of a special laboratory preparation the potentialities of wheat starch are increased, as indicated by a viscosity curve which exceeds that of corn. A low-purity

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starch, as exists in tailings, gives a hot paste with relatively low body. These hot-paste viscosities are reflected in the Scott viscosities used in industry, i.e., corn has a higher Scott viscosity than ordinary wheat starch. Beckord and Sandstedt (3) have studied the effect of granule size on the light transmission curves of wheat starch slurries when heated, and have found that the curves are essentially similar in character for large and small granules, indicating that the two types of wheat starch granules are similar in gelatinization characteristics. The hot pastes of both corn and wheat starches set back to rather firm, opaque gels upon cooling, but wheat starch gel is softer than that of corn.

The ability of pregelatinized starches to form pastes with water can also serve as a comparison of wheat and corn. Here again it is evident that corn starch forms a slightly heavier paste than ordinary wheat starch. This difference, however, is not an inherent one, because the special laboratory preparation of wheat starch is quite superior to the corn in body. The water absorption capacity of pregelatinized starches likewise is helpful in evaluating their colloidal properties. Corn starch holds somewhat more water than ordinary wheat starch. However, special wheat starch holds the most water.

Amylose — Amylopectin. After the starch granule has been completely gelatinized the principal properties of the dispersion are determined by the amylose and amylopectin molecules then present. The present status of our knowledge on this point is that wheat starch contains 24% amylose (and 76% amylopectin), whereas corn has 28% amylose (and 72% amylopectin) (25). The exact difference in the fine details of wheat amylose and amylopectin as compared to corn still awaits further clarification from more fundamental research endeavors along these lines. As yet no waxy wheat starch (100% amylopectin) has been discovered, as has been the case with corn and sorghum.

Uses of Wheat Starch. Wheat starch was probably the first starch ever used by man. The Egyptians used it as food and for binding fibers to make papyrus as far back as 3000 B.C. Today, however, in the U.S. approximately 98% of all starch produced is made from corn. More than 50% of this starch is converted into corn sirup and dextrose, and the cheapest available starch is generally used for this purpose. The important consumers of starch as such are the food, textile, paper, laundry and adhesive industries.

Since the use of starch is determined primarily by the adhesiveness and viscosity of its paste, starches composed of different types of granules would be expected to have different applications. For instance, root starch pastes have much less tendency to "set back" than those of the cereal starches. At the present time wheat starch is used in many fields where corn is employed. This is due to a similarity of many of the wheat paste properties with those of corn.

Wheat starch is, however, considered to be superior for laundry work. As was pointed out by Furry (14), this is probably due to the large range in granule sizes in wheat starch. The smaller granules have the power to penetrate the fibers of the fabric, whereas the larger ones coat the exterior surface. A considerable amount of wheat starch is used in the manufacture of wallpaper paste; in addition to having very good adhesive properties, the wheat paste has good water retention and possesses a slip-and-slide property which is important to the paperhanger. The pure whiteness of wheat starch makes it useful in several specialties, e.g. as a component in some pharmaceutical tablets and cosmetic preparations. The cold gel of a starch paste is recognized to be softer than that of corn starch, which is a desirable characteristic for some food uses. Wheat starch is a natural additive for many food products which already contain wheat flour. Starch is used for the production of chemicals, such as ethyl alcohol, butyl alcohol, acetone, glycerol, lactic acid, butylene glycol, glucuronic acid, and many others. The choice of starch here depends entirely on availability and price and not on any particular property of one starch with reference to another.

The following brief summary indicates the varied uses of wheat starch by industry today: commercial laundry starches; wallpaper pastes; oil-well drilling muds; foundry core-binder; wall sizing; box and laminating gums; cigarette papers; printing inks; textile printing; beater additive in paper industry; binder for plaster board and wall board; textile mills; envelope dextrins; cake mixes; carrier for bakery additives.

Wheat Starch By-Products

Screenings. The screenings removed from the starch slurry may

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amount to about 4.5% of the flour used, and are removed from the screens as about 10% solids. This material is a waste material at present. The starch is probably held in a pentosan matrix as described by Clendenning and Wright (9). The protein is considered to be mostly gluten.

Top water. The top water contains about 23% of the original flour, but because it consists only of 1% solids it is difficult to handle economically and is generally discarded to the sewer.

Wheat Gluten

The protein portion of the separated wheat gluten is considered to be composed of gliadin (a prolamin) and glutenin (a glutelin). The exact relative proportion of the two components is difficult to ascertain because of differences in analytical methods employed (4). In general, the gluten is not fractionated and as such finds two important commercial uses: 1) "gum gluten," which still retains its native elastic properties and finds use in the manufacture of high protein flours; 2) monosodium glutamate, which is finding increasing use as an improver of natural food flavors. Glutamic acid is a constituent of practically all proteins, wheat gluten being one of the richest and most economical sources. The naturally occurring isomer, L-glutamic acid, is the form which is important in the accentuation of food flavors.

Monosodium glutamate. In manufacturing monosodium glutamate from wheat gluten, the protein is completely hydrolyzed by boiling with strong hydrochloric acid. Filtration separates the humin and excess acid is removed from the filtrate by evaporation under diminished pressure. Crystals of glutamic acid hydrochloride precipitate from the acid hydrolysate. By the addition of caustic the hydrochloride is changed over to glutamic acid and then monosodium glutamate, which crystallizes in a 99%-pure form as the monohydrate. The filtrate remaining after the removal of most of the glutamic acid contains the other amino acids originally present in the gluten and is referred to as "hydrolysate" in this discussion (20).

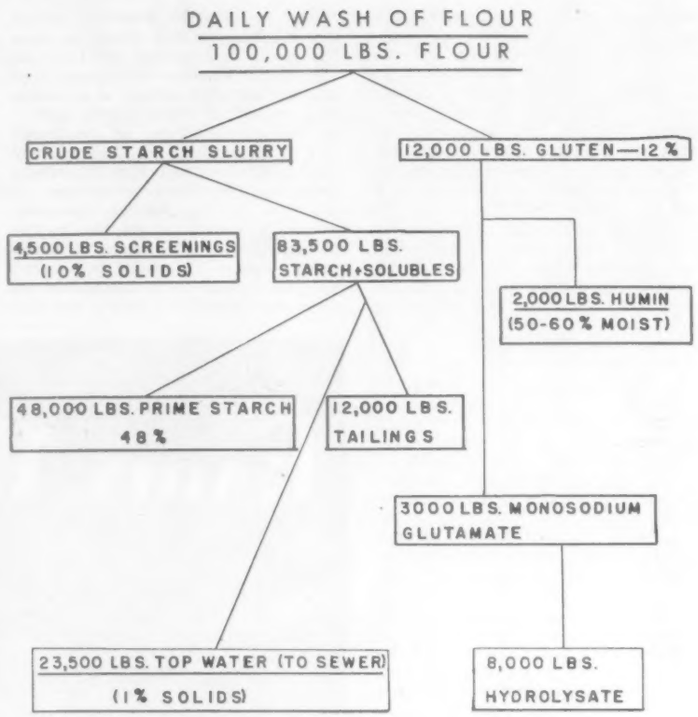
DAILY WASH OF FLOUR
100,000 LBS. FLOUR
CRUDE STARCH SLURRY
12,000 LBS. GLUTEN—12 %
4,500 LBS. SCREENINGS (10% SOLIDS)
83,500 LBS. STARCH+SOLUBLES
2,000 LBS. HUMIN (50-60 % MOIST)
48,000 LBS. PRIME STARCH 48 %
12,000 LBS. TAILINGS
3000 LBS. MONOSODIUM GLUTAMATE
23,500 LBS. TOP WATER (TO SEWER) (1% SOLIDS)
8,000 LBS. HYDROLYSATE

FIG. 1—Flour separation (Martin process).

Sweet and salty tastes in food are accentuated by monosodium glutamate, whereas it seems to suppress sourness or bitterness in many cases (8). The flavor improvement is most notable in the case of meats and sea foods, but many vegetable dishes also are made more appealing. The flavor effect seems to be greatest for those foods which have pH values ranging from 5.0 to 6.5. Recently Fagerson (12) has shown that there is a possible relationship between the ionic species of glutamic acid and flavor.

Glutamic acid. Glutamic acid itself, even though it is one of the so-called nonessential amino acids, has many interesting physiological functions. It is unique among the amino acids in that it alone is utilized by cerebral tissue. Glutamic also is an important constituent of insulin, glutathione and folic acid. In recent years glutamic acid has received attention as a therapeutic agent in one form of epilepsy and in increasing the IQ of mentally retarded children (15).

The other amino acids remaining in the hydrolysate, after the glutamic acid has been removed, can be concentrated and used as such in food sauces. Groups of the amino acids and also individual ones such as tyrosine, cystine, and leucine can be isolated.

Humin. The humin accumulating in the manufacture of monosodium glutamate from wheat gluten is a waste material today. Approximately 50% of the solids present in humin can be extracted with ether to give primarily free fatty acids of which linoleic, oleic, and palmitic are the main constituents. The balance of the product, after it has been extracted with ether, is a black, amorphous substance which is probably composed of polymers of amino acids and starch originally present in the gluten.

Other uses of gluten. "Gluten sulfate" can be prepared by the addition of cold concentrated sulfuric acid to gluten. This product has the unusual property of absorbing rapidly 100 to 300 times its weight of water to form a firm, odorless, tasteless, and nontoxic gel, which has possibilities of serving as a substitute for scarce natural gums in pharmaceutical preparations (27). The principal drawback to "gluten sulfate" is its estimated cost of $8 to $10 a pound. Recently a similar gel-forming product has been reported, a phosphorylated derivative of wheat gluten, with an estimated cost of $2 per pound (21).

Gliadin, extracted from wheat gluten, has been demonstrated to be an excellent additive at low concentrations (0.005% - 0.01%) in preventing soil redeposition in textile cleaning operations using aqueous alkaline-built alkylarylsulfonate detergent solutions (13). Strong, elastic, translucent films, useful for medicinal capsules, can be formed by heating dry undenatured gluten with glycerin and concentrated hydrochloric acid and then blending the mixture with wet gluten (17). Undenatured, powdered gluten can also be mixed with glycerol and treated under pressure to give a chewing-gum base (18). Gliadin can be incorporated in dry cells to inhibit the corrosion of the zinc anode (22). Water-resistant, clear, flexible films of gliadin can be made by reacting the gliadin with ammonium sulfate and glycerin (24). Adhesives can be prepared by reacting gluten with acrylonitrile and methyl acrylate in an alkaline solution (10). Ether carboxylic acids are suitable plasticizers for materials

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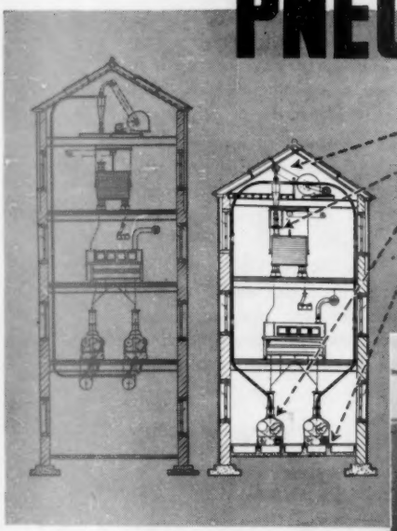

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MINIMUM LIFT—Stock is lifted vertically through rollermills.

A STRAIGHT FLOW from hopper allows basement-fitted rollermills.

A typical layout of Robinson Receiver Aspirators—Type PFm

Look for these five all-important factors when choosing a pneumatic conveying system 1—overall efficiency, 2—power consumption, 3—freedom from chokes, 4—simplicity of layout, 5—the space it occupies, plus freedom of access to vital machinery.

'Pneu-Flow' was designed to withstand this searching scrutiny. Only 'Pneu-Flow' offers the advantage of lifting stock vertically from the hopper, up through the rollermill. New minimum lift of stock saves power. Absence of vicious bends makes hold-ups a thing of the past. Yes, 'Pneu-Flow' is choke-proof. Better still, 'Pneu-Flow' is available, versatile, sanitary, adaptable to *any* mill or smut department.

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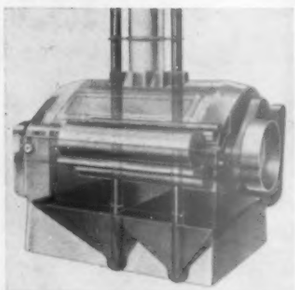
Compare the savings with the outmoded, conventional layout, left. See how bends are smoothed out—even avoided. Notice, too, how the vertical lift is cut down. 'Pneu-Flow' reduces building heights and power consumption.



A "ghosted" rollermill showing the vertical lift from the hoppers.

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composed basically of prolamines, such as gliadin and zein (23). These plasticized products are suitable for such uses as molded products, sizings, coatings, flexible films, and adhesives. In this connection it is, of course, worth while to consider the tremendous amount of work which has already been done in finding uses for corn zein, much of which could be applied to wheat gliadin. The bibliography on zein by Rathmann (26) is certainly a noteworthy contribution to the field of protein chemistry.

Conclusion

Outside of the flour-milling industry, wheat today is the raw material for a few industries which are separating the starch and gluten and manufacturing a large variety of commodities for both food and non-food utilization. Considerably more research is needed to clarify many of the hidden secrets in the wheat starch granules and also in the structure of the wheat amylose and amylopectin molecules. This increased knowledge will undoubtedly lead to more uses for wheat starch. In wheat starch manufacture the screenings and top-water by-products present serious operating difficulties; more research on these materials should change them from complete waste products into useful commodities, and thus improve the economy of this industry. More research is also needed on the humin and on the many amino acids remaining in the hydrolysate after the glutamic acid has been removed.

To be sure, the wheat-starch industry is not without its problems, but with increased knowledge resulting from both fundamental and applied research it should be able to grow with the rest of our nation's industries and to be important in our economy by utilizing some of the wheat surplus.

Literature Cited

1. Bailey, C. H.—The constituents of wheat and wheat products; Reinhold, New York (1944).
2. Baker, J. C., Parker, H. K., and Mize, M. D.—The pentosans of wheat flour; Cereal Chem., 20:267-279 (1943).
3. Beckord, O. C., and Sandstedt, R. M.—Starch gelatinization studies. I. Simplified equipment for the study of starch gelatinization by means of light transmission; Cereal Chem., 24:250-258 (1947).
4. Blish, M. J.—Wheat gluten. In advances in protein chemistry, Vol. 2; ed. by M. L. Anson and J. T. Edsall; Academic Press, New York (1945).
5. Block, R. J., and Bolling, D.—The amino acid composition of proteins and foods (2nd ed.); Charles C. Thomas, Springfield, Ill. (1951).
6. Brautlecht, C. A.—Starch: its sources, production and uses; Reinhold, New York (1953).
7. Caesar, G. V., and Moore, E. E.—Consistency changes in starch pastes; Ind. and Eng. Chem., 27:1447-1451 (1935).
8. Cairncross, S. E.—The effect of monosodium glutamate on food flavor. In monosodium glutamate (Symposium Proceedings); Q. M. Food and Container Institute for the Armed Forces, Chicago, Ill. (1948).
9. Clendenning, K. A., and Wright, D. E.—Separation of starch and gluten. V. Problems in wheat starch manufacture arising from flour pentosans; Can. J. Research, F28:390-400 (1950).
10. Coffman, J. R.—Chemical modification of proteins; U.S. Patent 2,562,534 (July 31, 1951).
11. Corn Industries Research Foundation—Wh(e)at next? Corn, 10:1 (Spring, 1954).
12. Fagerson, I. S.—Possible relationship between the ionic species of glutamate and flavor; J. Agr. and Food Chem., 2:474-476 (1954).
13. Fong, W., and Lungren, H. P.—Prevention of soil redeposition in textile cleaning operations by proteins and other polymeric materials; Textile Research J., 23: 769-775 (1953).
14. Furry, Margaret S.—Some physical properties of starch pastes which affect their stiffening power on fabrics; U.S. Dept. Agr. Tech. Bull. 284 (1932).
15. International Minerals and Chemical Corporation—The present nutritional status of glutamic acid; Chicago (1950).
16. Kerr, R. W.—Chemistry and industry of starch (2nd ed.); Academic Press, New York (1950).
17. Lowen, L., Kormendi, L., and Boeskeler, B. C.—Gluten composition; U.S. Patent 2,461,829 (Feb. 15, 1949).
18. Lutz, W. J.—Chewing gum; U.S. Patent 2,586,675 (Feb. 19, 1952).
19. MacMasters, M. M., Slotter, R. L., and Jaeger, C. M.—Starch production; Am. Miller and Processor (January, 1947).
20. Melnick, D.—Monosodium glutamate—Improver of natural food flavors; Sci. Monthly, 70:199-204 (1950).
21. Mohammad, A., Mecham, D. K., and Olcott, H. S.—Gel-forming phosphorylated derivative of wheat gluten; J. Agr. and Food Chem., 2:136-137 (1954).
22. Morehouse, C. K., Hamer, W. J., and Vinal, G. W.—Effect of inhibitors on the corrosion of zinc in dry-cell electrolytes; J. Research Natl. Bur. Standards, 40:151-161 (1948).
23. Morgan, W. L., and Faelton, C. R.—Plasticized prolamine and derivative composition; U.S. Patent 2,507,263 (May 5, 1950).
24. Obey, J. H.—Gliadin suspensions and films; U.S. Patent 2,430,885 (Nov. 4, 1947).
25. Radley, J. A.—Starch and its derivatives (3rd ed.), Vol. 2; Chapman - Hall, London (1953).
26. Rathmann, D. M. Zein—An annotated bibliography 1891-1953; Mellon Institute Bibliographic Series, Bull. 7, Pittsburgh, Pa.
27. Reitz, H. C., Ferrel, R. E., and Olcott, H. S.—Gel-forming derivative of wheat gluten; Ind. Eng. Chem., 36:1149-1151 (1944).
28. U.S. Department of Agriculture—Agricultural statistics (1953).
29. U.S. Department of Agriculture—Wheat, its products and uses; U.S. Dept. Agr., Bureau of Agricultural and Industrial Chemistry, Agr. Research Admin., ACE-189 (December, 1942).
30. U.S. Department of Agriculture—Report of conference on wheat research; U.S. Dept. Agr., Bureau of Agricultural and Industrial Chemistry, Agr. Research Admin. (October, 1953).

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INSIDE SCIENCE

The Vital Story of FARINA and PASTINA ENRICHMENT

by Science Writer

This article is one of a series devoted to the story of vitamin enriched or restored cereal foods; white bread and rolls, white flour, corn meal and grits, macaroni products, white rice, breakfast cereals and farina.

What is Farina? Sometimes called the "heart of the wheat," farina is wheat (other than durum varieties) which has been ground and bolted in granular form and from which virtually all of the bran coat and germ have been removed.

It is an excellent source of food energy, providing 370 calories per 100 grams. Its composition is largely carbohydrate (77.4 grams per 100 grams) with some protein value (10.9 grams per 100 grams) and low fat content.

This excellent, palatable food makes a fine dish for infants and children at any meal. For adults it is particularly good as a breakfast food when served with cooked or dried fruits. Being bland, it has a special place in the diets of the elderly and invalids of all ages.

Pastina Defined. Pastina is the product which is derived from durum wheat and with which egg yolks and sometimes other ingredients are processed. It, too, is an excellent food for babies and children and has a special place in adult diets, being used as a cereal or by being added to soups and broths.

Why Enrich Farina and Pastina? Because so much of the vitamin and mineral content of the wheat is contained in the germ and bran which must be removed to make farina and pastina, enrichment to restore important values is absolutely necessary.

Enriched Farina. The Food and Drug Administration of the U. S. Department of Health, Education and Welfare has established minimum levels of these essential food elements which all *enriched farina,* sold in interstate commerce, must meet. These are as follows. All figures are in milligrams per pound.

Thiamine (vitamin B_1)	1.66
Riboflavin (vitamin B_2)	1.20
Niacin	6.00
Iron	6.00

In addition to the above, the F. & D. A. allows the addition of other food elements at the manufacturer's option. Among these are:

Vitamin D . . 250 U.S.P. units per pound
Calcium . . . 500 milligrams per pound

Enriched Pastina. Enrichment requirements for macaroni and noodle products, of which *pastina* is one, are as follows. All figures are in milligrams per pound and include allowances for losses which may occur in cooking. These are standards established for the consumer by the Food and Drug Administration.

	Min.	*Max.*
Thiamine (vitamin B_1)	4.0	5.0
Riboflavin (vitamin B_2)	1.7	2.2
Niacin	27.0	34.0
Iron	13.0	16.5

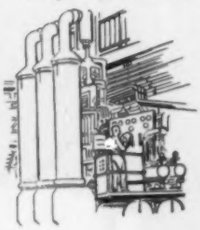
Again, the F. & D. A. allows manufacturers to add optional ingredients including vitamin D and calcium in the quantities noted below.

	Min.	*Max.*	
Vitamin D	250	1000	(U.S.P. units per lb.)
Calcium	500	625	(mg. per lb.)

Enrichment's Simplicity. Enrichment is really a simple process. The enriching ingredients (vitamins and minerals) are added to the food during processing. The consumer then receives farina or pastina which equals or exceeds the values of the original wheat in vitally important vitamins and minerals.

Physicians, nutritionists, dietitians —and consumers—support enrichment enthusiastically. It is such an important factor in public health that not only farina and pastina and other macaroni products, but family white flour, white bread and rolls, corn meal and grits and white rice are enriched.

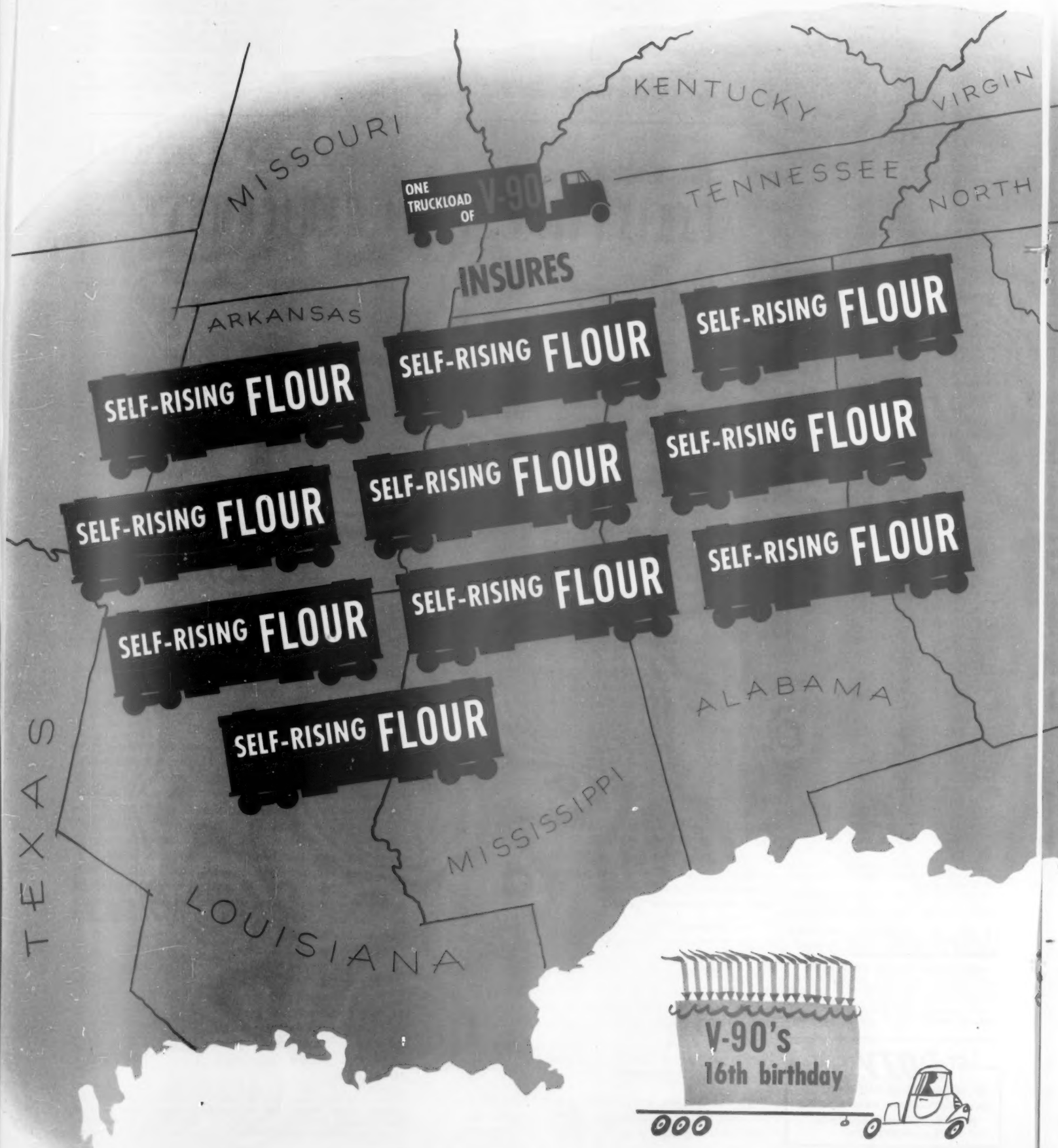
Duplicating Nature. The science of chemistry is so advanced these days that many of Nature's complex substances can be duplicated in the laboratory. This has happened with many vitamins. First, the chemical composition is learned. Second, the pure substance is isolated. Third, a "duplicate" is made by synthesis. And fourth, the laboratory techniques are extended to large scale operation. The manufactured duplicate is identical chemically and in biological activity with Nature's own product. A vitamin is still a vitamin regardless of its source. So efficient is large scale manufacturing that vitamins are sold at a lower cost than if they were extracted from natural sources.



The Hoffmann-La Roche people make top-quality vitamins actually by the tons. To do this they use amazingly complex processes with scientific production controls and the latest equipment which fill buildings each a city block square and many stories high.

Reprints of this article, and all others in the series, are available without charge. Please send your request to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul St., West; Montreal, Quebec

A little phosphate goes a



L-O-N-G way in affecting FLOUR SALES

Have you ever stopped to realize that *ten, 60,000-pound carloads* of self-rising flour are made with just one, 5-ton truckload of phosphate? That's enough to please . . . or displease your customers in many important markets! That's why it is so *very* important to choose the right phosphate for your self-rising flour.

Yes, a *little* phosphate *does* go a long way—and *little* variations in the quality . . . a *little* faster rate of reaction . . . a coating that does *not* give *quite* enough protection . . . all these *little* things can seriously affect the sale of your self-rising flour and self-rising corn meal.

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This reader service department announces the development of new and improved products, new services and new literature offered by manufacturers and suppliers. Claims made in this department are those of the firm concerned. Use the accompanying coupon to obtain the desired information.

No. 5051—Vacuum Cleaner

The Burrows Equipment Co. announces the addition of the new Tornado vacuum cleaners and blowers to its line of grain testing and handling equipment. The new vacuum cleaner has been redesigned for more power and a larger capacity than in the past. The new unit also has conversion attachments to increase the capacity to 55 gal. For more complete details check No. 5051 on the coupon and mail it.

No. 5008—Impact Mill

The Entoleter Division of the Safety Car Heating & Lighting Co., Inc., has introduced its new 27-in. impact mill for use in the manufacture of formula feeds. The machine consists of a rotor 27 inches in diameter on which are mounted 36 pins between two horizontal plates which form the rotor, and is driven at 1,550 r.p.m. Size of the motor used is determined by the capacity desired, the manufacturer states. Applications in feed mills claimed by the manufacturer include "positive and complete dispersion of all trace ingredients in the formulation, elimination of segregation by reducing agglomeration in feeds, and low cost operation." The machine's capacity is one ton per hour per horsepower, e.g., 50 tons per hour with a 50 h. p. motor, according to the manufacturer. It is stated by the manufacturer that agglomeration in mash feeds through the addition of oil and molasses can be eliminated with the use of the Entoleter impact mill and blender. The firm will process free of charge product samples (5-25 lb.) and return them for the customer's evaluation. Complete information regarding the application of the impact mill may be obtained by circling No. 5008 on the coupon and mailing it to this newspaper.

No. 5055—Grain Fumigant

A folder describing its grain fumigant, Lethogas, has been prepared by the Parsons Chemical Works. Entitled "Facts and Data on Parsons Lethogas," the folder tells how the product works as a fumigant for grain weevil and certain other insects. The product forms a gas upon exposure to air, destroys by contact and gas fumes and is not a fire hazard, it is claimed. The product is sold in 5-gal., 30-gal. and 55-gal. drums for use in larger structures and in ½-gal., 1-gal. and 5-gal cans for farm use. Facts about Kilane residual spray, an insecticide spray, are also included in the folder. Methods for the hand in hand use of Lethogas and Kilane to control weevils are outlined. To secure the folder check No. 5055 on the coupon and drop it in the mail.

No. 5004—Grain Trailers

Extremely light weight, combined with great strength, is the characteristic of the new line of Dorsey "Champion" grain trailers. A 32-ft. tandem "Champion" grain trailer with 10.00x20 tires weighs 8,080 lb., and a comparable single-axle "Champion" weighs only 6,155 lb. The capacities of both the tandem grain

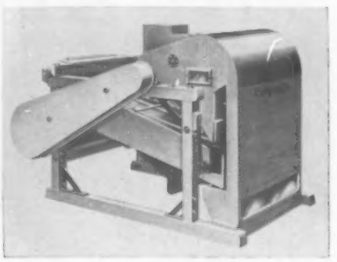
trailers and the single axle models are actually increased over previous models, and can carry more than 54,000 lb., and 36,000 lb., of net payload respectively. Standard lengths for both trailers are 26 to 36 feet. Rear construction with trap doors and removable header was specially engineered for grain shippers needing loading ease for return loads. For further information check No. 5004 on the coupon and mail it.

No. 5037—Bag Closing Machines

A new illustrated bulletin entitled "Suspended Head Bag Closing Machines" has been issued by the Union Special Machine Co. These machines are desgined for cable suspension from overhead mounting, using either a top balance or counter-weight, according to the bulletin. The sewing head has a built-in motor, finger tip controls, automatic brake and chain cutter. The machines are portable and can be hung up and plugged in at any location. It is claimed that the machines will handle all weights of bags both textile or paper. To secure the bulletin check No. 5037 on the coupon and drop it in the mail.

No. 5067—Grain and Seed Cleaner

Thomas Robinson & Son, Ltd., announces the production of a dual purpose cleaner, type PDm, offering high capacity at low power consumption. As a pre-cleaner the capacity is 15 tons an hour and five tons as a



grain and seed cleaner. The manufacturer states that the machine is highly adaptable. It can be installed in any building, with one or several floors. Feed can be directly from a bin, through spouting, or by elevator while power can be from an in built motor, line shaft. To secure more details check No. 5067 on the coupon and drop it in the mail.

No. 5065—Bag Packer

A new, smaller bag packer is now available from the H. L. Stoker Co. Extensive tests in commercial operations on this bagger, called the Econo-Speed model 54, have been very satisfactory, company officials said. The packer fills valve or open-mouth bags and drums. It is said to deliver 1 cubic foot in five to 10 seconds, depending on the material handled. Delivered as a complete package, it merely has to be plugged in to the electrical circuit to operate. It is designed to handle practically any powdered or granulated material such as sulfur, clays, rosin, paint pigments, asbestos, some plastics, titanium, alfalfa meal, insecticide dusts, certain fertilizers and many other hard-to-handle materials. For more complete details check No. 5065 on the coupon and drop it in the mail.

No. 5002—Magnetic Separator Bulletin

The new MEMCO series of Gravity Flow and Pneumatic Hump Alnico non-electric magnetic separators are illustrated and described in Bulletin

275-A issued by the Magnetic Engineering & Mfg. Co. The firm claims greater protection from tramp iron hazards in pipe and chute conveyor lines is possible with these units. The

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gravity flow unit is available in 11 standard sizes 4 in. to 48 in. while the Pneumatic Hump may be had in 10 sizes ranging from 4 in. to 40 in., with either in special sizes for other requirements. Magnet elements are offered in four strengths and the bulletin contains charts for determining the proper size of magnet for different installations. For a copy of this bulletin check No. 5002 on the coupon and mail it.

No. 3624—Tape

The Chicago Printed String Co. now has available a tape called the Zip-Open tape, for use in the self-opening corrugated case field. Informative literature on this product has

been prepared and is available without charge. The company states that the user can have the tape applied wherever his particular products can be most advantageously divided. Check No. 3624 on the coupon, clip and mail it to secure this literature.

——BREAD IS THE STAFF OF LIFE——

A Lesson in Welding Operations

By J. P. CORCORAN

Engineer, Mill Mutual Fire Prevention Bureau

A recent report of a loss caused by an explosion from welding operations brings forcibly to mind the lessons that must be learned from such practices. Fortunately this particular fire loss was small, but there have been many large losses amounting to considerable dollar volume in property loss because of these operations. Loss of life due directly or indirectly to these fires is also an important factor.

The losses percentagewise may not be as great as some of the other better known causes for fire losses but the hazard, regarded as a common hazard in plants which the Mill Mutual Fire Insurance Companies insure, is one which can be avoided much more than it is if just the most simple regulations are to be followed.

A bulletin prepared by the Mill Mutual Fire Prevention Bureau entitled "Don't Gamble With Cutting and Welding Fires" is available to everyone upon request. This bulletin discusses the requirements to be followed before starting, during and after the welding job. The requirements are simple and easy to follow and would mean no hardship to anyone.

The reason this most recent loss had occurred would be because these simple rules were not followed. We have only experience to guide us many times, unfortunate though it may be, and each time a welding loss occurs, it seems that one or more of the prescribed rules are violated The worst abuse here has been that the machinery was not shut down during the welding operation and this is most significant because in not shutting the machinery down, it was impossible to isolate and protect the very area that was indirectly responsible for propagating the heat which caused the ultimate explosion. Whether or not the immediate area had been cleaned before the job had been started, or whether any men had been posted with ready first aid fire fighting equipment has not been indicated.

It was just a simple thing. A welding operation had to be performed and it involved welding metal brackets to a metal elevator leg; but, the leg was not shut down while the welding was being done. Here we have this lesson spelled out very plainly for us.

——BREAD IS THE STAFF OF LIFE——

Plant Show Scheduled

NEW YORK — The next Plant Maintenance and Engineering Show will be held Jan. 24-27, 1955, at the International Amphitheatre in Chicago, according to Clapp & Poliak, Inc., New York.

The conferences sessions for engineers and production heads will be held in the arena adjoining the exhibits.

Here's why COLD WEATHER FUMIGATION can be effective

There've always been several basic misconceptions about insect infestation during cold weather; also about cold-weather grain fumigant effectiveness.

It's frequently said: *(1) that grain insects become dormant or inactive in cold weather; (2) that, since the insects are dormant, they become resistant to fumigants; (3) that there's therefore little use in fumigating grain in cold weather.*

The trouble with the foregoing reasoning is that it begins with faulty assumptions and ends with false conclusions.

In the first place, the insects live in the grain. Hence their "weather" is the grain temperature. Cold weather has little to do with the internal temperatures of sizable bins of grain *unless* the grain is transferred.

Second, if infested grain is neither treated nor transferred, the insects are a worse threat in cold weather than in mild weather. Cold weather drives insects inward in an undisturbed grain mass. The insects instinctively "bunch". They thus create worse spot heating than in warm weather, often causing serious moisture condensation on adjacent surface grain.

Third, with their tendency to "bunch" and create warmth, insects don't become dormant in grain unless the grain temperature is below 60° F. *And how much grain have you ever had to treat in that temperature range?*

Fourth, while it's theoretically true that insects show increasing resistance to fumigant action as grain temperature is lowered, this isn't actually true—*not within the grain temperature range at which nearly all grain is fumigated.*

Fifth, it's actually the other way 'round. All fumigants are severely handicapped by high grain temperatures *accompanied by heating or poor grain condition* because such factors impede proper gas penetration, diffusion and sorption. But, with lower temperatures and proper grain condition, all fumigants benefit by more efficient action and increased sorption.

Below 70° F. the efficiency of fumigants containing slow-volatility compounds is supposedly lowered because of delayed vaporization. But the more effective and versatile liquid fumigants show increasing effectiveness down to a grain temperature of around 60° F.

Hence, don't be misled by the common cold-weather bogey about insect dormancy and fumigant ineffectiveness. More important, don't let it lull you into neglecting your grain. Infestation in untransferred grain is much more dangerous in cold weather. Don't be concerned whether your grain is too cool for effective treating. (It won't be.) Worry about whether it's too warm. If it is, run it and condition it. You can then fumigate effectively.

The above facts and conclusions have long been common knowledge to most elevator men having the widest experience in handling and treating large volumes of grain. The Weevil-Cide Company was merely the first to recognize, publicize and correlate the observed facts with the supporting technical background.

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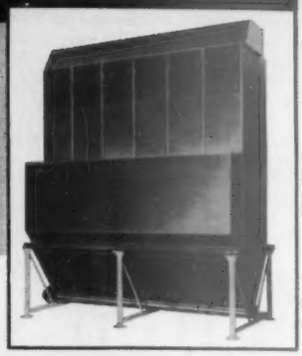

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Automatic Proportioning System Outlined

NEW YORK — An automatic proportioning operation involving the centralized remote control of the selecting, feeding, weighing and mixing of 30 different ingredients was discussed here by Ingram Richardson, president of Richardson Scale Co., at the recent meeting of the American Society of Mechanical Engineers.

In this proportioning system, which was designed by Richardson for the new feed mill of Cooperative Mills, Inc., at Seaford, Del., ingredients are brought from storage bins to three automatic hopper scales (see Fig. 1). Batches are discharged in unison to screw conveyors leading to two 3-ton mixers. The mixers turn out 45 tons of product hourly, one unit being charged while the other is mixing. They maintain a continuous delivery of mix to either sacking scales or bulk trucks.

"Formulas are constantly being changed to provide the necessary ingredients for chick starter, broiler mash, laying mash, calf starter, pig supplements, and all the rest," Mr. Richardson said. "Frequent formula change becomes necessary because of the desire to produce directly from bulk ingredients storage to railroad car delivery (usually in 50-lb. or 100-lb. sacks), eliminating floor storage of sacked material and the double handling which that would involve.

"Carloads ordered by dealers are usually made up of several different kinds of feed so production facilities must make it possible to change from one to another with a minimum of delay."

At the master control panel (see Fig. 2) the operator has before him three remote dial scale indicators so that he can see the progress of the cumulative weighing at each of the three hopper scales. He also has 30 weight selecting verniers whereby he can select the ingredients which his formula calls for and the number of pounds of each. Indicating lights show a full supply of material, the feeders which are selected and the particular feeder which is running as the scale in question accumulates its weight.

Also on this panel are the timers which determine the length of mixing time for both mixes so that batches are delivered alternately to one mixer and then to the other, continuously so long as that formula is being run.

"A batch stop-counter permits the operator to establish the number of 3-ton batches which his order called for after which the system will shut down automatically so that a new formula can be established," Mr. Richardson continued.

"Interlocks are provided which will prevent a feeder from running unless there is a full batch supply ahead of it; will prevent a new batch being started unless the scale dial returns

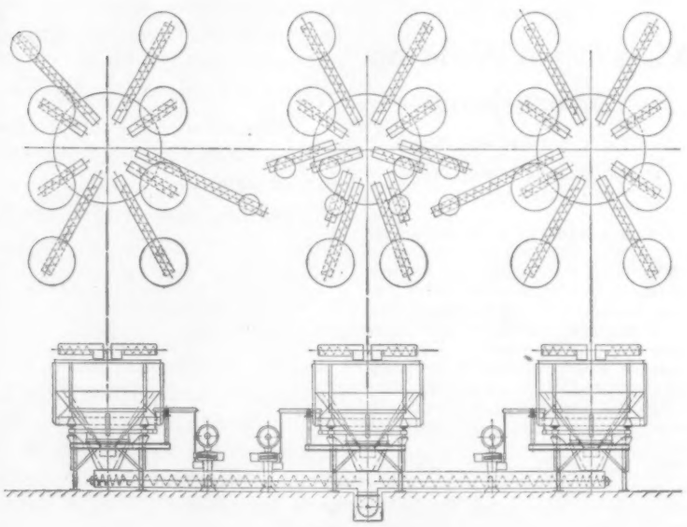

Figure 1

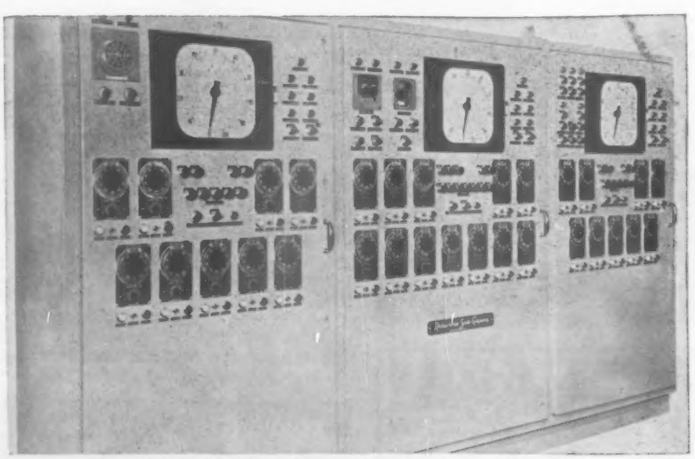

Figure 2

to zero indicating a complete discharge of the previous batch; will stop the system automatically if the operator fails to set his weight verniers on a cumulative basis; and will stop the entire system if any motor overload kicks out. These interlocks are tied in with bulls-eye lights so that the operator will be advised immediately of any faulty condition.

"Under unusual conditions, the entire system can also be operated manually, by-passing all of the electronic control, merely by pushing a button to start a selected feeder. With 30 feeders there are 30 such jog buttons, and by watching the remote scale dials on the panel, the operator can perform the entire batching by manual control."

Each of the remote scale dials on the panel can be equipped with circular chart recorders so that the amount of each weighing in pounds can be permanently recorded, Mr. Richardson pointed out. However, he said, this was not required on this particular job, although the company is planning to put remote electric inventory counters into the system for each ingredient. Thus, a permanent record of material usage and a perpetual inventory of bulk material will be maintained.

The new plant is located at Seaford whereas the company's main offices are in Baltimore. It is quite possible, Mr. Richardson said, for these remote material usage counters to be located on a panelboard in Baltimore, connected with the plant in Delaware by the company's teletype system. Thus, headquarters would know exactly what is being done at the plant while it is being done.

"It may be asked why a new plant of this kind stays with the batch system rather than one which does the proportioning of ingredients continuously," Mr. Richardson said. "Both batch and continuous systems are widely used in this and other industries, but the trend is to batch proportioning. The reason is primarily for accuracy of weighing. One graduation of a dial scale represents 1/10 of 1% of the capacity and the control system is easily accurate to one graduation.

"With continuous weighers (which we also manufacture) the amount being weighed at any one instant is only a few pounds which, resolved to 1/10 of 1% or even ¼ of 1%, requires an accuracy often to within a fraction of an ounce, impossible outside of the materials handling laboratory.

"Also, the accuracy of the batch system can be verified at the scale dials before the batch is discharged to the mixer and on to process. With continuous feeder-weighers verification of accuracy can only be accomplished by interrupting the stream with a test pan and stop watch, removing a sample from the process for check and subsequent calibration. Even after proper calibration, there is no way of checking a machine of the continuous type to be sure that it is remaining in calibration without repeating the sampling process.

"The batch system also provides means for almost instantaneous change-over from one formula to another with verification at the single control panel. A system of punched cards will, in fact, make such a change-over instantaneous, and it is only a matter of time before industry will accept this further degree of instrumentation."

EUROPEAN MILLS AND MILLING

(Continued from page 1a)

didn't make any difference whose system it was. They were all operating very satisfactorily. Ninety-five per cent of all mills visited highly favored the use of pneumatic handling of mill stocks. However, not one miller would state that the use of pneumatic handling alone would result in improved flour yields or percentages. Their main reason for favoring pneumatic was that it resulted in a cleaner and more sanitary mill. It creates a better condition within the sifter section which results in better bolting, and it provides for a more flexible arrangement of equipment and building. In addition, most millers stated that pneumatic handling in the mill required about 15% more horsepower in comparison with the conventional bucket elevator.

Approximately 25% of the mills visited were employing the use of pneumatic handling in the wheathouse. These installations were also operating very successfully, but to me they were a disappointment. My thoughts can best be summed up in the words of an English miller. In effect he said that to elevate wheat, the most efficient means today is still the bucket elevator. However, he added that in his opinion pneumatic handling in the wheathouse will not be economical until the proper wheat cleaning machines are designed to fit in with the pneumatic system. Of all millers talked to, approximately 50% favored pneumatic in the wheathouse. The other 50% were opposed because it took too much power for the benefits gained.

After reading this, you have no doubt decided that I was very much impressed in general with European mills and their milling. This is certainly true, and both the miller and mill engineer in Europe deserve a lot of credit for the job they have accomplished. However, I think the time has now come for a "point of order" in behalf of the American miller. During the past five years there have been many statements made and articles written, attempting to draw out a comparison between European and American milling. In most cases, these comparisons certainly did not look with favor on our milling industry. After visiting the mills abroad, I am thoroughly convinced that no one can actually make an accurate comparison of their milling techniques versus the practices employed in this country. The successful miller is one who can take the wheat available and profitably supply the consumer with the product he wants.

The conditions that exist between countries are so very much different that milling techniques which are considered good for some countries may be just the wrong thing for others. To me, one of the outstanding examples of this is the capacity per units of equipment used in this country as compared with European mills. They use two and three times as much equipment, which I believe is due principally to the type of wheat they grind and the profitable practice of obtaining longer extraction flours. On the other hand, the American miller, over the past 50 years, has done a remarkable job of increasing the output of existing mills,

32 new installations

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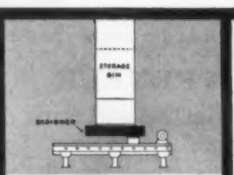

One application of the Exbinner is as a conveyor feeder. It also may be used as a feeder to elevator.

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simply by taking advantage of the wheats grown in this country. At the same time he has maintained profitable extraction levels and is producing a flour that meets the demands of the American customer.

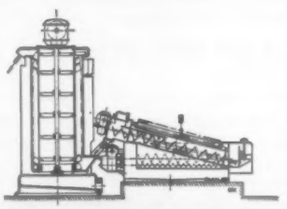
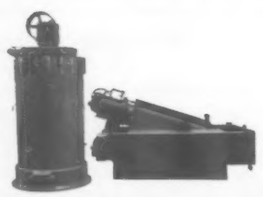
Another example of what I am talking about could go something like this: The European miller is consistently pointing to the fact that their local wheats are of a very poor quality for bread baking in comparison with American wheats. This is very true, and it would resemble a condition in this country of trying to supply a strong bakers flour made from soft red winter wheat. On the other hand, it certainly appeared to me that the characteristics of their local wheats had possibilities for making excellent cake flour. Yet after traveling to eight different countries and sampling their cakes and pastries, I can truthfully make the statement that in my opinion the American miller is far superior to the European miller in the production of a high quality soft wheat cake flour. This statement is made purely on the basis that I, as a customer, certainly did not like the taste of the cakes that were being produced in Europe as compared with the cakes that we have here in America. I realize that this statement will provoke many an argument because flour alone is not the only factor involved in making a good cake. Besides the people of Europe no doubt like the cakes they are accustomed to, which is the main point I am trying to make.

Again I say, it is very difficult to compare American and European milling. An excellent job is being accomplished by both, and most of the unfavorable publicity which has in the past been directed at the American miller is not justified.

In closing, I strongly emphasize that, as operative millers, we still have the everlasting job of improving the milling process for greater efficiency and better products. We all have the important responsibility of giving our top management sound recommendations in connection with the spending of capital money for desired improvements. These recommendations should be based on an impartial analysis of all milling techniques and all milling equipment available on today's market.

BUHLER

WASHERS & STONERS

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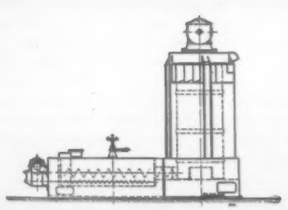

(Type MPY) — A compact Buhler unit designed for small-space cleaning requirements. Combined operations of cleaning worm, stoning worm and whizzer provide truly economical cleaning, with low water and power consumption. Where the water available for cleaning is of a corrosive nature (chlorinated or sea water), this washer is supplied in special corrosion-resistant materials.

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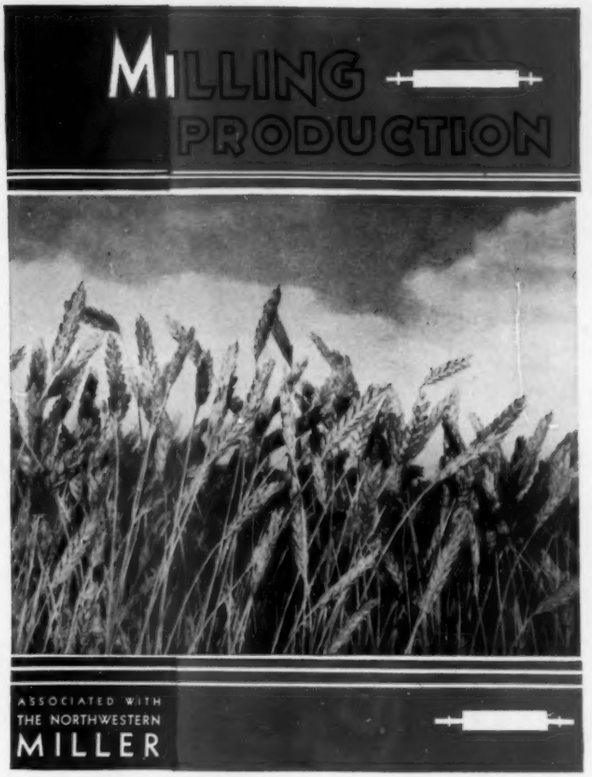

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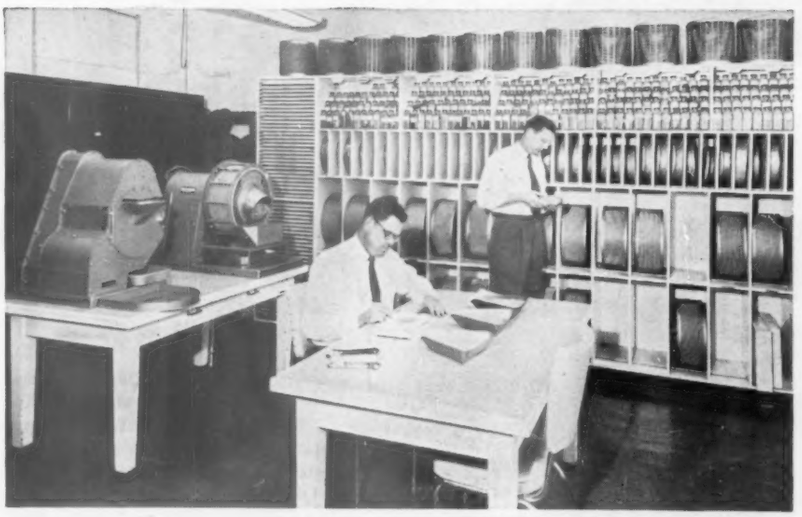

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The Carter Precision Grader laboratory model (center) is used for either thickness or width sizing.

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